WHAT IS CLAIMED IS:

1. A rotational electric machine comprising:

a stator having windings; and

a split rotor rotatably disposed on an inner circumferential side of said stator through an air gap and axially divided into two rotor portions, said rotor portions having different-polarity field magnets disposed alternately in a rotational direction;

one of said rotor portions including a changing mechanism for changing an axial position of said one rotor portion relative to an axial position of the other rotor portion in accordance with a direction of torque of said rotor;

said one rotor portion being supported from axially opposite sides by a support mechanism.

2. A rotational electric machine comprising:

a stator having windings; and

a split rotor rotatably disposed on an inner circumferential side of said stator through an air gap and axially divided into two rotor portions, said rotor portions having different-polarity field magnets disposed alternately in a rotational direction;

one of said rotor portions including a changing mechanism for changing a phase of synthesized magnetic poles of said field magnets relative to that of magnetic poles of the other rotor portion in accordance with a direction of torque of said rotor;

said one rotor portion being supported from

axially opposite sides by a support mechanism.

3. A rotational electric machine comprising:

a stator having windings; and

a split rotor rotatably disposed on an inner circumferential side of said stator through an air gap and axially divided into two rotor portions, said rotor portions having different-polarity field magnets disposed alternately in a rotational direction;

one of said rotor portions including a changing mechanism for changing an axial position of said one rotor portion relative to that of the other rotor portion while shifting a magnetic pole center of said field magnets disposed in said one rotor portion and another magnetic pole center of said field magnets disposed in said other rotor portion in accordance with a direction of torque of said rotor, said one rotor portion being supported from axially opposite sides by a support mechanism.

4. A rotational electric machine comprising:

a stator having windings; and

a split rotor rotatably disposed on an inner circumferential side of said stator through an air gap and axially divided into two rotor portions, said rotor portions having different-polarity field magnets disposed alternately in a rotational direction;

one of said rotor portions including a changing mechanism for changing a phase of synthesized magnetic poles of said field magnets relative to that

of magnetic poles of said field magnets of the other rotor portion while shifting a magnetic pole center of said field magnets disposed in said one rotor portion and another magnetic pole center of said field magnets disposed in said other rotor portion in accordance with a direction of torque of said rotor, said one rotor portion being supported from axially opposite sides by a support mechanism.

5. A rotational electric machine comprising:

a stator having windings; and

a split rotor rotatably disposed on an inner circumferential side of said stator through an air gap and axially divided into two rotor portions, said rotor portions having different-polarity field magnets disposed alternately in a rotational direction;

one of said rotor portions including a changing mechanism for changing an axial position of said one rotor portion relative to that of the other rotor portion while truing up a magnetic pole center of said field magnets disposed in said one rotor portion and another magnetic pole center of said field magnets disposed in said other rotor portion in accordance with a direction of torque of said rotor, said one rotor portion being supported from axially opposite sides by a support mechanism.

6. A rotational electric machine comprising:

a stator having windings; and

a split rotor rotatably disposed on an inner

circumferential side of said stator through an air gap and axially divided into two rotor portions, said rotor portions having different-polarity field magnets disposed alternately in a rotational direction;

one of said rotor portions including a changing mechanism for changing a phase of synthesized magnetic poles of said field magnets relative to that of magnetic poles of said field magnets of the other rotor portion while truing up a magnetic pole center of said field magnets disposed in said one rotor portion and another magnetic pole center of said field magnets disposed in said other rotor portion in accordance with a direction of torque of said rotor, said one rotor portion being supported from axially opposite sides by a support mechanism.

7. A rotational electric machine according to Claim 1, wherein said other rotor portion is fixed to a rotation shaft, said one rotor portion is configured so as to be separable from said rotation shaft, and thread portions are provided on an inner circumferential side of said one rotor portion and on said rotation shaft respectively so as to be thread-engaged with each other.

8. A rotational electric machine according to Claim 1, wherein said other rotor portion is fixed to a rotation shaft, said one rotor portion is configured so as to be separable from said rotation shaft, a ring member having a thread portion in an inner

circumferential side thereof is provided on an inner circumferential side of said one rotor portion through a non-magnetic member, and a thread portion is provided on said rotation shaft so that said thread portions are thread-engaged with each other.

9. A rotational electric machine according to Claim 1, wherein said other rotor portion is fixed to a rotation shaft, said one rotor portion is configured so as to be separable from said rotation shaft, a pipe-like protrusive portion is provided on a side surface of said one rotor portion; a recess portion is provided in a side surface of said other rotor portion so that said recess portion is capable of receiving said protrusive portion, a ring member having a first thread portion in an inner circumferential side thereof is provided on an inner circumferential side of said one rotor portion through a non-magnetic member, and a second thread portion is provided on said rotation shaft so that said first and second thread portions are thread-engaged with each other.

10. A rotational electric machine according to Claim 8, wherein said non-magnetic member is constituted by a pipe-like member having electrical resistivity higher than that of iron.

11. A rotational electric machine according to Claim 8, wherein said ring-like member is constituted by a nut.

12. A rotational electric machine according to

Claim 1, wherein said support mechanism has an elastic body provided between said rotor portions, and another elastic body provided on a side of said one rotor portion.

13. A rotational electric machine according to Claim 1, wherein said support mechanism has an elastic body provided between said rotor portions, a support member provided on a side of said one rotor portion so as to be axially movable along said rotation shaft, and a drive mechanism for moving said support member along said rotation shaft.

14. A rotational electric machine according to Claim 13, wherein said drive mechanism is constituted by a servo mechanism.

15. A rotational electric machine according to Claim 1, wherein said support mechanism relaxes an axially moving force of said one rotor portion.

16. A rotational electric machine according to Claim 1, wherein a size of said air gap between said one rotor portion and said stator is different from another size of said air gap between said other rotor portion and said stator.

17. A rotational electric machine according to Claim 1, wherein a size of said air gap between said one rotor portion and said stator is selected to be larger than another size of said air gap between said other rotor portion and said stator.

18. A rotational electric machine according to

Claim 1, wherein an lead angle of a current supplied to said windings is corrected in accordance with displacement in synthesized magnetic pole position of the field magnets disposed in said one rotor portion and the field magnets disposed in said other rotor portion.

19. A rotational electric machine according to Claim 1, wherein a quantity of axial displacement of said one rotor portion relative to said other rotor portion is detected so that a lead angle of a current supplied to said windings is corrected on a basis of said quantity of axial displacement.

20. A rotational electric machine comprising:

a stator having windings;

a rotor having field magnets, said field magnets being constituted by a first field magnet having different-polarity magnetic poles arranged successively in a rotational direction and a second field magnet being rotatable relative to said first field magnet and having different-polarity magnetic poles arranged successively in said rotational direction;

said first and second field magnets being provided opposite to magnetic poles of said stator and having a mechanism for changing a phase of synthesized magnetic poles of said first and second field magnets relative to that of magnetic poles of said first field magnet in accordance with a direction of torque of said

rotor; said mechanism for changing the phase in accordance with the direction of torque having means for truing up a magnetic pole center of said first field magnet and another magnetic pole center of said second field magnet on a basis of balance between the direction of torque generated in said rotor and magnetic action force between said first and second field magnets, and means for shifting the magnetic pole centers of said first and second field magnets whenever the direction of torque generated in said rotor is inverted; said second field magnet being supported from axially opposite sides by a support mechanism.

21. A vehicle comprising:

an internal combustion engine for driving wheels;

a battery for charging and discharging electric power;

a rotational electric machine mechanically linked with a crank shaft of said internal combustion engine and driven by electric power supplied from said battery to thereby drive said internal combustion engine and driven by motive power from said internal combustion engine to thereby generate electric power to be supplied to said battery;

an electric power converter for controlling said rotational electric machine;

a control unit for controlling said electric power converter;

said rotational electric machine being constituted by a rotational electric machine according to any one of Claims 1 through 20.

22. A vehicle according to Claim 21, wherein said rotational electric machine is operated as an electric motor at a low rotational speed of said internal combustion engine and as a power generator at a high rotational speed of said internal combustion engine.

23. A vehicle comprising:

a battery for charging and discharging electric power;

a rotational electric machine supplied with electric power from said battery to thereby drive wheels; an electric power converter for controlling said rotational electric machine;

a control unit for controlling said electric power converter;

said rotational electric machine being constituted by a rotational electric machine according to any one of Claims 1 through 20.

24. A vehicle comprising:

an internal combustion engine for driving front or rear wheels;

a battery for charging and discharging electric power;

a rotational electric machine driven by electric power supplied from said battery to thereby drive said front or rear wheels;

an electric power converter for controlling said rotational electric machine;

a control unit for controlling said electric power converter;

said rotational electric machine being constituted by a rotational electric machine according to any one of Claims 1 through 20.

25. A vehicle comprising:

an internal combustion engine for driving wheels;

a battery for charging and discharging electric power;

a rotational electric machine mechanically linked with a crank shaft of said internal combustion engine and driven by electric power supplied from said battery to thereby drive said internal combustion engine;

an electric power converter for controlling said rotational electric machine;

a control unit for controlling said electric power converter;

said rotational electric machine being constituted by a rotational electric machine according to any one of Claims 1 through 20.

26. A vehicle comprising:

an internal combustion engine for driving wheels;

a battery for charging and discharging

electric power;

a rotational electric machine mechanically linked with a crank shaft of said internal combustion engine and driven by motive power from said internal combustion engine to thereby generate electric power to be supplied to said battery;

an electric power converter for controlling said rotational electric machine;

a control unit for controlling said electric power converter;

said rotational electric machine being constituted by a rotational electric machine according to any one of Claims 1 through 20.